

THERMAL SPRAY PROCESSING

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Thermal spray processing has been used for a number of years to cost-effectively apply TBCs for a wide range of heat engine applications. In particular, bond coats are applied by plasma spray and HVOF techniques and partially-stabilized zirconia top coats are applied by plasma spray methods. Thermal spray involves melting and rapid transport of the molten particles to the substrate, where high-rate solidification and coating build-up occur. It is the very nature of this melt processing that leads to the unique layered microstructure, as well as the apparent imperfections, so readily identified with thermal spray. Modeling the process, process-induced residual stresses, and thermal conductivity will be discussed in light of a new understanding of porosity and its anisotropy. Microcracking can be understood using new approaches, allowing a fuller view of the processing-performance connection. Detailed electron microscopic, novel neutron diffraction and fracture analysis of the deposits can lead to a better understanding of how overall microstructure can be controlled to influence critical properties of the deposited TBC system.

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